

ALBRIGHT & WILSON LTD.CONTENTS

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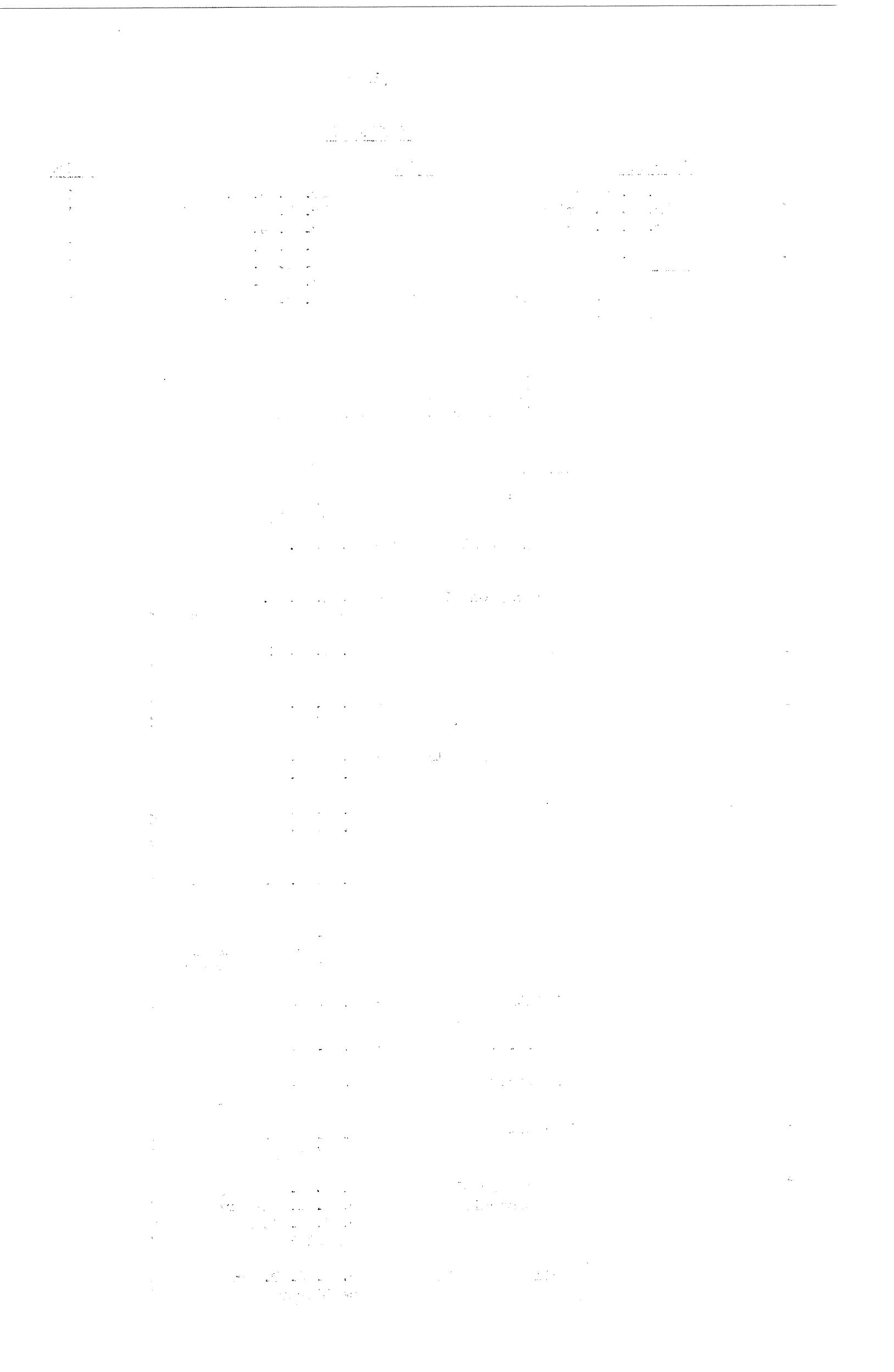
CIRCULATION

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ALBRIGHT & WILSON LTD.

SUMMARY

1. Introduction

This report presents revised information about Albright & Wilson Ltd. and Marchon Products Ltd. - now amalgamated - which were the subjects of earlier separate reports*.

Albright & Wilson, the only manufacturers of phosphorus in Britain, convert a substantial part of their output of 40,000 tons a year to non-agricultural phosphates, the demand for which (particularly from the detergent industry) has increased rapidly since the war. To meet this demand they completed new factories (doubling their capacity) at Portishead and Kirkby in 1954; and in 1955 they further strengthened their position by purchasing Marchon Products Ltd., the only other British manufacturer of detergent phosphates. In February 1960 they successfully bid for the capital of A. Boake, Roberts & Co. (Holding) Ltd., makers of phosphate and phthalate plasticizers and other chemicals; but only the financial aspect of the merger is covered in this report^f.

2. Business between I.C.I. and Albright & Wilson

I.C.I.'s sales to the Albright & Wilson group were £2.6 million in 1958 and £2.9 million in 1959; its purchases from the group were £1.6 million in 1958, and £1.7 million in 1959. Certain overseas subsidiaries of I.C.I. are agents for Albright & Wilsons' products in their various territories.

3. Financial Position

Assuming full acceptance of their offer for Boake Roberts, Albright & Wilsons' issued share capital will be raised from £9.2 million to £10.1 million, and their loan capital from £7.5 million to £8.1 million. The net profit of the group (not including that of Boake Roberts) has increased from £1.8 million in 1958 to £2.4 million in 1959.

4. Activities

(a) Phosphorus

At Oldbury and Portishead, Albright & Wilson extract some 40,000 tons a year of phosphorus from rock phosphate by electrothermal reduction with carbon in presence of silica.

* Reports Nos. 480315/HO/NH/SC (March 1948), 51034/HO/SC (September 1951), and 55010/HO/SC (July 1955).

^f For recent information on Boake Roberts, see report No. 59021/HO/SC (July 1959).

(b) Phosphoric Acid and Phosphates

Albright & Wilsons' output of phosphoric acid from phosphorus is probably 100,000 tons a year (as 100% H₃PO₄); in addition, Marchon Products make 30,000 tons a year of 'wet'-process phosphoric acid. Both make detergent phosphates, and are the only producers in Britain of sodium tripolyphosphate, having a combined capacity of 75,000 tons a year. Albright & Wilson also manufacture a range of phosphates for water treatment, food preparation, and fire-proofing.

(c) Other Phosphorus Compounds

Albright & Wilson produce 6,000 tons a year of phosphorus trichloride, most of which they convert to phosphorus oxychloride and thence to organic phosphorus compounds. They also make phosphorus sesquisulphide (for match-making) and small amounts of phosphorus pentasulphide.

(d) Carbon Tetrachloride

Prominent among Albright & Wilsons' non-phosphoric products is carbon tetrachloride, of which they make 14,000 tons a year at Widnes from chlorine and carbon disulphide supplied by I.C.I. Fifty-five per cent. of the output is taken back by I.C.I. for use in the manufacture of 'Arcton'. Albright & Wilson are extending their carbon tetrachloride capacity to 18,000 tons a year.

(e) Detergents

Marchon Products make 80,000 tons a year of detergent powders and smaller amounts of liquid detergents. The surface-active constituents of these preparations are sulphated fatty alcohols and alkyl aryl sulphonates, both of which Marchon make at Whitehaven (the latter from purchased dodecyl benzene).

(f) Oil Additives

Albright & Wilson are probably the largest British producers of oil additives. They make these mainly under licence from the Lubrizol Corporation of America and sell them, under the trade name 'Anglamol', through the jointly-owned company Lubrizol (Great Britain) Ltd. Besides phosphorus pentasulphide and organic phosphorus compounds, the range includes 'Cereclor', of which I.C.I. is supplying more than 1,300 tons a year.

Marchon Products have an exclusive agreement with C. C. Wakefield & Co. Ltd. to supply them with acrylic viscosity index improvers, of which they make 1,000 tons a year from I.C.I.'s methyl methacrylate monomer.

(g) Silicones

Albright & Wilson are joint owners, with Dow Corning Corporation of America, of Midland Silicones Ltd., the principal manufacturer of silicone products in Britain. This company is producing 1,100 tons a year of silicones (61% siloxane content) at Barry, and has plans to increase its output considerably during the next few years.

(h) Strontium Salts

Bristol Mineral & Land Co. Ltd., a subsidiary of Albright & Wilson, mines 6,000 tons a year of celestine (strontium sulphate) near Chipping Sodbury. Much of the ore is exported, but some is converted by Albright & Wilson to strontium chloride and nitrate.

(i) Sulphuric Acid and Cement

From its own deposits of anhydrite at Whitehaven, Solway Chemicals produces more than 100,000 tons a year of sulphuric acid (as 100% H₂SO₄), mainly for use by Marchon Products Ltd., and a similar quantity of cement clinker which is taken by Associated Portland Cement Manufacturers Ltd.

(j) Metal Finishing Processes

Albright & Wilson are licencees of the American 'Kanigen' process for plating metals with a nickel-phosphorus alloy. Under the name of 'Phosbrite' they make and sell a range of chemical polishes based on phosphoric acid for non-ferrous metals.

(k) Water Treatment Service

Albright & Wilson sell 'Calgon' and other sodium phosphates for water treatment, and offer technical service to promote their application. I.C.I. buys some of these products for incorporation in certain 'Alfloc' preparations.

5. Research and Development

Albright & Wilson have recently developed a number of organic phosphorus compounds including certain resins based on phosphonitrilic chloride, and they are seeking ways to reduce the cost of manufacturing phosphoric acid and sodium phosphates. Marchon Products have started to recover sodium silicofluoride from the gases released from their 'wet'-process phosphoric acid plant, and are proposing to make sulphamic acid. None of these developments appears to promise a substantial return.

6. Competition and Relations Between Albright & Wilson and I.C.I.

Except in silicones and, to a lesser extent, in water-treatment chemicals, competition between Albright & Wilson and I.C.I. is small; but in silicones it is likely to be intensified as both companies endeavour to increase their output and sales.

The traditionally strong ties between the companies have been weakened by this growing rivalry and by other influences (notably the changes in I.C.I.'s policy concerning chlorine and mono-ammonium phosphate); but relations between their responsible officials continue to be friendly.

7. Future Prospects

Albright & Wilson stand to benefit from the steadily growing demand for detergent and other industrial phosphates; but they will have to meet increasing competition, both at home and abroad, from European producers as trade barriers in the Common Market and the Free Trade Area are removed. Their recent attempts to diversify their production do not appear to promise a significant increase of business; and it remains to be seen what advantage they will gain from their acquisition of A. Boake, Roberts & Co. Ltd., who have been losing ground in plasticizers (their main interest) to their competitors.

8. Principal Subsidiary and Associated Companies

- (a) Albright & Wilson (Manufacturing) Ltd.: the group's principal operating company.
- (b) Marchon Products Ltd.: the third largest producer of soapless detergents in the United Kingdom.

- (c) Midland Silicones Ltd.: makes at Barry, Glamorgan, 80 per cent. of the silicones produced in Britain.
- (d) The Electric Reduction Co. of Canada Ltd.: makes phosphorus, phosphates (both industrial and agricultural), and sodium chlorate: now owns one-fifth of the group's total assets.
- (e) Albright & Wilson (Australia) Pty. Ltd.: jointly owned by Albright & Wilson and I.C.I.A.N.Z.: phosphorus, phosphates, and detergent sulphonates are its main products.
- (f) Albright & Wilson (Ireland) Ltd.: manufacturers of food phosphates, fine chemicals, and household cleaning preparations.

SIGNED: J. G. MORRIS
MIDLAND REGION

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ALBRIGHT & WILSON LTD.

I. INTRODUCTION

Albright & Wilson Ltd. and their subsidiary, Marchon Products Ltd., have already been the subjects of Sales Control reports*. The present report is intended to bring up to date the information previously given about these companies and - since they are now amalgamated - to present it in combined form. Except for the financial aspect, it does not cover the recent integration of Albright & Wilson with A. Boake, Roberts & Co. (Holding) Ltd.^f

To keep pace with the growing demand for phosphates in Britain - and particularly for the sodium tripolyphosphate used by detergent makers - Albright & Wilson have continued to expand during the last eight years. In 1954 they installed new electrothermal phosphorus and phosphate plants at Portishead and Kirkby, and in 1955 they acquired the share capital of Marchon Products Ltd., with whose 'wet'-process phosphate plant at Whitehaven they regained their former monopoly in sodium tripolyphosphate. They have likewise greatly extended their phosphorus, phosphate, and chlorate installations in Canada, partly offsetting the cost by selling their American subsidiary company, Oldbury Electro-Chemical Co. Inc. Midland Silicones Ltd. now produce in substantial quantity the silicones which they initially imported from America; and a number of new products have been added to the group's range of oil additives.

Albright & Wilson buy from I.C.I. products worth nearly £3 million a year, and provide I.C.I. with materials worth £1.7 million a year. Despite a growing rivalry in silicones and in other directions, relations between the companies, though less intimate, continue to be friendly.

* Albright & Wilson Ltd. by G. K. Skidmore and G. E. Scharff, March 1948, 480315/HO/NH/SC (and a supplement thereto by G. E. Scharff, September 1951, 51034/HO/NH/SC).

Marchon Products Ltd. by A. L. Gale, July 1955, 55010/HO/SC.

^f A Sales Control report on Boake Roberts - 59021/HO/SC, by D. A. McL. Clark - was issued in July 1959.

II. I.C.I. SALES TO ALBRIGHT & WILSON

1. Sales to Constituent Companies

Company	1958	1959
	£	£
Albright & Wilson (Manufacturing) Ltd.	1,796,373	1,965,465
Marchon Products Ltd.*	674,645	703,942
Midland Silicones Ltd.	118,920	190,676
Other companies	25,675	25,505
Total	2,615,613	2,885,588

* Including Solway Chemicals Ltd.

The sales to Albright & Wilson (Manufacturing) Ltd. and Marchon Products Ltd. are analysed below; those to Midland Silicones Ltd. consisted almost entirely of methyl chloride.

Sales to Albright & Wilson (Manufacturing) Ltd.

Product	1958	1959
	£	£
Chlorine, liquid	566,655	600,972
Sodium carbonate	447,304	510,908
Carbon disulphide	374,622	387,374
'Cereclor'	135,173	129,963
Isobutanol	46,751	80,338
Caustic soda	52,827	52,965
Ammonia (gas and liquor)	41,004	39,897
n-Butanol	11,976	22,389
Lime	18,215	17,412
Methanol	17,143	12,287
Octyl phenol	8,700	12,028
Chlorobenzenes	11,049	11,975
Nitric acid	10,632	11,765
Other products	54,322	75,192
Total	1,796,373	1,965,465

Sales to Marchon Products Ltd.

Product	1958	1959
	£	£
Sodium carbonate	410,864	434,680
Caustic soda	53,721	54,906
Methanol	46,744	37,336
Chlorosulphonic acid	26,437	31,226
Methyl methacrylate monomer	19,328	30,702
Silicate of soda	23,413	23,381
Nitrate of soda	19,720	20,880
Explosive powders	15,879	19,640
Butanol	7,413	9,970
'Kemsol'	1,472	6,832
'Limbux'	14,474	6,789
Other products	35,180	27,600
Total	674,645	703,942

2. Sales by Divisions and Products

Division and Product	1958		1959	
	Quantity	Value	Quantity	Value
<u>Alkali Division</u>	tons	£	tons	£
Sodium carbonate	73,895	861,250	78,601	947,410
Caustic soda (all grades as 76% Na ₂ O)*	1,542	45,072	656	21,311
Silicate of soda	2,180	23,413	2,127	23,381
Calcium chloride	1,591	22,169	1,632	22,997
Bicarbonate of soda	248	3,955	326	5,581
Other products	-	3,853	-	4,219
		959,712		1,024,899
<u>General Chemicals Division</u>				
Chlorine	19,699	567,100	20,507	601,407
Carbon disulphide	6,801	374,622	7,466	387,374
Methyl chloride	880	106,762	1,497	174,664
'Cereclor'	1,386	135,173	1,352	129,963
Caustic soda (all grades as 76% Na ₂ O)*	2,121	62,181	2,947	87,083
Ammonia	633	40,262	705	39,897
Chlorosulphonic acid	998	26,437	1,148	31,226
Methyl methacrylate monomer	75	19,328	125	30,660
Chlorobenzenes	234	17,237	259	19,056
Nitric acid	223	10,632	247	11,765
Formic acid	42	4,222	82	8,250
'Kemsol'	146	1,732	643	7,039
Sodium formate	85	4,584	90	4,739
Methylene chloride	64	6,093	50	4,619
Hydrochloric acid	457	5,068	378	3,999
Other products	-	25,770	-	22,307
		1,407,203		1,564,048
<u>Lime Division</u>				
Lime - all grades	6,704	31,080	5,286	24,277
<u>Billingham and Heavy Organic Chemicals Divisions</u>				
Isobutanol	471	46,953	828	80,870
Methanol	1,533	65,346	1,239	51,254
n-Butanol	604	19,187	237	33,891
Nitrate of soda	664	19,769	713	20,929
Octyl phenol	40	8,706	59	12,028
Iso-octyl alcohol	11	1,950	56	9,683
Carbon dioxide	143	4,298	186	5,584
Ethylene oxide	-	-	26	4,226
Sulphate of ammonia	391	9,302	141	3,220
Diphenyl oxide	1	225	11	3,168
Other products	-	9,860	-	14,314
		185,596		239,167
<u>Nobel Division</u>				
Explosives and accessories	-	19,565	-	19,640
Other products	-	2,057	-	1,569
		21,622		21,209
<u>Other Divisions</u>				
All products	-	10,400	-	11,988
TOTAL		2,615,613		2,885,588

* The total sales of caustic soda were therefore 3,663 tons (£107,253) in 1958 and 3,603 tons (£108,394) in 1959.

In addition to chemical products, I.C.I. supplies Albright & Wilson with electric power for their factory at Widnes. In 1958 they consumed 82 million kWh (valued at £416,000); but having closed down their electric furnaces there early in 1959, they now take less than 2 million kWh a year.

3. Competition with Other Suppliers

I.C.I. supplies the whole of Albright & Wilsons' requirements of sodium carbonate and ammonia under five-year total-consumption contracts, and all their needs of caustic soda, 'Cereclor', chlorine, lime, carbon disulphide, methyl chloride, and butanols under contracts of shorter term. Albright & Wilson now say, however, that I.C.I. enjoys too large a share of their business, and that their choice of suppliers must be determined, in future, by the simple consideration of price and quality alone. I.C.I., therefore, is more frequently opposed than hitherto by competitors seeking a share of Albright & Wilsons' business, and has lost in the last few years orders for salt, oxalic acid, and chloroacetic acid. Moreover, during 1958 and 1959 Albright & Wilson have been approached by Murgatroyd's Salt & Chemical Co. Ltd. with offers of chlorine and caustic soda at prices below those charged by I.C.I.; these offers have created difficulties for I.C.I. in renewing the contracts.

On the other hand, I.C.I. gained from Distillers in 1958 the whole of Albright & Wilsons' then custom for liquid carbon dioxide, of which the present rate of supply is 180 tons a year. This will soon be increased if I.C.I. can obtain another contract subsequently placed with Distillers. I.C.I. is also trying to win Albright & Wilsons' order for 200 tons a year of caustic potash liquor from F. W. Berk & Co. Ltd., and is seeking to supply their requirements of nitrate of soda amounting to 100 tons a year.

4. Agency Agreements

There are numerous agency agreements between Albright & Wilson and I.C.I. overseas subsidiaries who, as agents, handle the sale of an extensive list of Albright & Wilsons' products in their territories. The value of sales made under these agreements is given in the following table:

Agency Agreements between I.C.I. Subsidiary Companies
and Albright & Wilson (Manufacturing) Ltd.

Agent	Total Turnover: Year ended 30.9.57.
A.E. & C.I. East Africa	3,093
*I.C.I. Brazil	12,606
*Duperial Argentina	20,742
*Duperial Uruguay	4,640
I.C.I. (China)	7,703
I.C.I. (Export) Burma	9,475
I.C.I. (Export) Ceylon	3,126
I.C.I. (Export) Iraq	6,878
I.C.I. (Export) Lebanon	862
I.C.I. (Export) Singapore }	33,960
I.C.I. (Malaya) }	
I.C.I. (India)	146,996
I.C.I. (Israel)	6,558
I.C.I. (N.Z.)	97,258
I.C.I. (Pakistan)	22,316
*I.C.I. (Peru)	2,560
I.C.I. (South Africa)	98,750
I.C.I. (Sudan)	446
I.C.I. (Turkey)	4,588
Total	482,557

All these agreements cover the sale of phosphorus chemicals and phosphates; most of them also include analytical and fine chemicals; and although in certain instances there are special arrangements for amorphous phosphorus and phosphorus sesquisulphide, only in four cases (marked thus *) are these two products entirely excluded.

In 1957 Albright & Wilson (Manufacturing) Ltd. appointed I.C.I. (Export) West Africa as an additional agent. Marchon Products Ltd. have an informal arrangement with I.C.I. (Export) Burma, who handle their alkyl aryl sulphonates.

III. I.C.I. PURCHASES FROM ALBRIGHT & WILSON

Company and Main Products	1958	1959	Remarks
<u>Albright & Wilson Ltd.</u>	£	£	
Carbon tetrachloride	621,400	651,200	All for General Chemicals Division: see Section VIII, page 16
Phosphoric acid	253,900	216,200	
Sodium hexametaphosphate ('Calgon')	145,000	117,400	Mainly for incorporation in 'Alfloc' products: see Section VIII, page 21
Sulphur	64,700	62,100	A by-product from the manufacture of carbon tetrachloride
Ammonium phosphates	12,100	55,400	
Sodium phosphates	45,200	49,600	
Phosphorus oxychloride	19,700	30,600	
Phosphorus trichloride	17,200	26,600	
Other products	70,042	105,581	
<u>Solway Chemicals Ltd.</u>	1,249,242	1,314,681	
Anhydrite	271,381	278,431	All for Prudhoe factory
<u>Marchon Products Ltd.</u>			
All products	39,395	57,517	Mainly fatty alcohols and sodium lauryl sulphate
<u>Other Companies</u>			
All products	12,443	23,556	
Total	1,572,461	1,674,185	

IV. HISTORY

Albright & Wilson originated in 1856 when Arthur Albright took into partnership John Edward Wilson, a merchant to whom he was related by marriage. Albright had been in business for several years at Selly Oak, Birmingham, as a manufacturer of match phosphorus and potassium chlorate, and in 1851 he had moved his plants to the site at Oldbury which is now the centre of the group's activities. The firm continued as a partnership until 1892 when it was made into a private limited company; this was converted to a public company in 1948. During the whole of this time both the ownership and the direction of the business remained firmly in the hands of the founders' families, whose supremacy was consolidated by many intermarriages.

Until 1914 the main outlet for Albright & Wilsons' production of phosphorus was afforded by the match trade; and despite their introduction in 1899 of phosphorus sesquisulphide as the safe ingredient of 'strike anywhere' matches the expansion of their business both at home and overseas remained modest. Nevertheless, in 1896, having acquired the rights of a new technique for making phosphorus in electric furnaces instead of in coal-fired retorts, they re-equipped their factory, at the same time moving part of their production to Niagara Falls in order to take advantage of the cheaper supplies of electricity available there. They formed a subsidiary, Oldbury Electro-Chemical Co. Inc., to operate this plant; and in 1902, after inconclusive litigation over the alleged infringement of their Canadian patents, they further increased their capacity for making phosphorus overseas by assuming control of the Electric Reduction Co. Ltd., of Buckingham, Quebec. For a short period after 1913 they also manufactured zinc by the electrolytic method.

During the First World War there was a substantial increase in the demand for phosphorus for military purposes: immediately afterwards, however, Albright & Wilson were compelled by a world-wide surplus of phosphorus to reduce their output considerably. In 1921 they decided to discontinue making phosphorus at Oldbury and to use that factory exclusively for the manufacture of phosphates from phosphorus supplied by their overseas subsidiaries. The demand for phosphates in Britain then grew so rapidly that by 1934 the company were earning 36 per cent. of their total profit from the sale of edible sodium pyrophosphates; much of the rest they derived from the sale of sodium phosphates used in washing compounds, or from the application of other metal phosphates as rust-arresting agents. To meet the extra requirements of phosphorus entailed by these developments, they re-opened their electric furnaces at Oldbury about 1933 and built additional ones at Widnes, where they also began to make carbon tetrachloride. In 1935 they further extended their range of phosphates by acquiring the manufacturing patents for sodium hexametaphosphate, a water-treatment chemical which had been developed in America by Dr. F. E. Hall.

In 1935 and 1936, Albright & Wilson formed subsidiary companies in Ireland and Australia. Albright & Wilson (Ireland) Ltd., initially wholly-owned but later converted to an associated company under the control of Irish nationals, manufactures baking powders and chemicals for water treatment; Albright & Wilson (Australia) Pty. Ltd. was a joint venture by Albright & Wilson (which holds the controlling interest) and I.C.I.A.N.Z. to make phosphorus, phosphates, and other phosphorus derivatives in Australia.

Albright & Wilson have always been ready to widen their interests by acquiring other firms. Thus, in 1932 they took over Clifford Christopherson & Co. Ltd., a firm of chemical merchants whose particular interest was in acid phosphates for baking purposes; a few years later they bought Thomas Tyrer & Co. Ltd. (now inactive), makers of a large range of fine chemicals; and in 1941 they purchased Bristol Mineral & Land Co. Ltd. in order to secure a source of celestine from which to make signal flares*. In 1944 they acquired a substantial minority interest in Anglamol Ltd. (now Lubrizol Great Britain Ltd.) who were then marketing the oil additives manufactured by the Lubrizol Corporation of America (some of these contained organic phosphates). Albright & Wilson assumed responsibility under licence for making these products in Britain, and have since considerably increased their output. Their most recent venture in this type of expansion was the acquisition, in February 1960, of the share capital of A. Boake, Roberts & Co. Ltd., makers of plasticizers and fine chemicals.

Since 1945 there has been a further marked increase in the demand for phosphates in Britain, particularly for the sodium tripolyphosphate used in the manufacture of soapless detergent powders. For some time Albright & Wilson were unable to supply the demand for this material from their home factories and were obliged to import it from their subsidiaries in Canada and America. They therefore installed a new phosphorus plant (more than doubling their previous capacity in Britain) at Portishead, on the Bristol Channel, and a new phosphoric acid and phosphates plant at Kirkby, near Liverpool. These plants came into full operation early in 1954. In the following year they further strengthened their position by acquiring (at a cost of £2.6 million) all the ordinary share capital of Marchon Products Ltd.*, the only other manufacturer of detergent phosphates in this country, to whose plant at Whitehaven they subsequently transferred some of their own production of detergent phosphates from Oldbury.

Albright & Wilson have been closely associated with the development of organic silicon derivatives in Britain. About 1930 they began to manufacture ethyl silicate as a stone hardener and as an ingredient for heat-resisting paints. Although they stopped making this product during the Second World War, they revived their interest in silicon compounds in a modified form in 1946 when they accepted the selling agency in Britain for the American Dow Corning Corporation's silicones.

* See section VIII 8, page 19.

* A detailed history of Marchon Products Ltd. can be found in report no. 55010/HO/SC.

In 1950 the two companies joined in forming Midland Silicones Ltd. (Albright & Wilson having the controlling interest), which began to manufacture silicones in Britain in 1954 under Dow Corning's licence.

Since the war, Albright & Wilson have greatly extended their interest in Canada where the Electric Reduction Co. Ltd. has spent more than \$26 million on new plants for the manufacture of phosphorus, detergent phosphates, and sodium chlorate. In America, however, the scale of their operations did not expand at a comparable rate, and therefore, in 1956, they accepted an offer from the Hooker Chemical Corporation to buy (in exchange for shares) all the assets of their subsidiary, Oldbury Electro-Chemical Co. Inc.

V. FINANCIAL POSITION

In view of Albright & Wilsons' recent acquisition of Boake Roberts, their new capital is here given, and the last published accounts of both companies are summarized and combined to give a broad impression of their combined assets and profits. (The figures assume 100 per cent. acceptance of Albright & Wilsons' offer.)

1. Share Capital

<u>Authorized</u>	<u>Issued</u>
£ 2,084,604	5% cumulative preference stock £ 2,334,604
£ 8,704,549	ordinary stock units of 5/- £ 7,764,021
£ 1,210,847	shares of £1
<hr/>	<hr/>
£12,000,000	£10,098,625
<hr/>	<hr/>

2. Loan Capital

	£
Albright & Wilson Ltd.:-	
5½% unsecured loan 1963/72 (repayable £400,000 per annum)	4,000,000
8% first mortgage debenture stock 1964 (ex Boake Roberts)	600,000
Subsidiaries:-	
Secured	3,372,349
Unsecured	87,650
	<hr/>
	8,059,999
	<hr/>

3. Balance Sheets

	<u>A. & W.</u> <u>31.12.58</u> <u>£000</u>	<u>B.R.</u> <u>29.3.59</u> <u>£000</u>	<u>Combined</u> <u>£million</u>
<u>Share Capital, Reserves, and Surplus</u>			
Issued capital	7,789	725	10.1*
Capital reserves	2,998	109	5.3*
Revenue reserves	4,567	1,872	4.6*
	<hr/>	<hr/>	<hr/>
	15,354	2,706	18.0
	<hr/>	<hr/>	<hr/>

* These figures take into account scrip issues during 1959 and new shares allotted to Boake Roberts' shareholders.

	<u>A. & W.</u> <u>31.12.58</u> <u>£000</u>	<u>B.R.</u> <u>29.3.59</u> <u>£000</u>	<u>Combined</u> <u>£million</u>
<u>Represented by:-</u>			
<u>Current Assets</u>			
Stocks	4,999	1,398	6.4
Debtors	3,890	1,009	4.9
Government securities	587	-	0.6
Short term deposits	1,525	-	1.5
Tax reserve certificates	600	-	0.6
Cash at bank, etc.	381	39	0.4
	<u>11,982</u>	<u>2,446</u>	<u>14.4</u>
<u>Deduct : Current Liabilities</u>			
Creditors	2,603	850	3.5
Taxation	2,149	27	2.2
Bank overdrafts, etc.	1,693	362	2.0
Dividends payable	470	31	0.5
	<u>6,915</u>	<u>1,270</u>	<u>8.2</u>
<u>Net Current Assets</u>	<u>5,067</u>	<u>1,176</u>	<u>6.2</u>
<u>Fixed Assets, at net book value</u>	<u>17,164</u>	<u>2,157</u>	<u>19.3</u>
<u>Trade Investments (market value approx. £5.2 million)</u>	<u>2,690</u>	<u>-</u>	<u>2.7</u>
	<u>24,921</u>	<u>3,333</u>	<u>28.2</u>
<u>Deduct:</u>			
Minority interests	674	27	0.8
Deferred taxation	1,433	-	1.4
Loan capital	7,460	600	8.0
	<u>9,567</u>	<u>627</u>	<u>10.2</u>
	<u>15,354</u>	<u>2,706</u>	<u>18.0</u>
4. <u>Profit and Loss Accounts</u>			
	<u>A. & W.</u> <u>31.12.58</u> <u>£000</u>	<u>B.R.</u> <u>29.3.59</u> <u>£000</u>	<u>Combined</u> <u>£million</u>
<u>Sales</u>	<u>32,200</u>	<u>say 2,000</u>	<u>34.0</u>
Trading profits	5,387	299	5.6
Deduct: Depreciation	2,059	179	2.2
<u>Net Profit before Tax</u>	<u>3,328</u>	<u>120</u>	<u>3.4</u>
Deduct: Taxation	1,542	33	1.5
<u>Net Profit</u>	<u>1,786</u>	<u>87</u>	<u>1.9</u>
Dividends, net of tax:-			
5% preference	60	7	0.1
Ordinary	585	43	0.9
	<u>645</u>	<u>50</u>	<u>1.0</u>

5. General Comments

Although the Boake Roberts figures are not insignificant in themselves their effect when combined with the Albright & Wilson figures is not great. The financial position of the new group looks healthy, with current assets exceeding current liabilities by a comfortable margin, and liquid assets ample in relation to immediate liabilities other than bank overdrafts. There is, however, a fairly high figure for loan capital and overdrafts (involving annual interest charges of about £500,000); and since Albright & Wilsons' known capital commitments at the date of their last balance sheet amounted to £6 million still to be financed, there may well have been an increase in borrowing since then. If the commitments mentioned conclude the capital expenditure programme then in the absence of a sharp reversal in the group's fortunes there seems to be no reason why these borrowings should not be progressively reduced.

Albright & Wilsons' preliminary figures for 1959 show a net profit of £2.4 million compared with £1.8 million in 1958 and the company has increased its dividend to 18.3 per cent. (covered nearly three times by profit) on the capital excluding shares issued to Boake Roberts' shareholders. The equivalent rate in 1958 was 13.6 per cent. The company expects to maintain the higher rate of dividend in 1960, and this would absorb profit to the extent of nearly £1 million.

VI. DIRECTORS AND STOCKHOLDERS

1. Directors

	stockholding at 12.6.59	
	<u>ord.</u>	<u>pref.</u>
William Beaumont Albright	267,000	-
Sydney Barratt	52,002	1,175
Wilson Carter	7,063	-
John Clifford Christopherson	19,375	2,500
Neil Malcolm Peech	1,250	-
Frederick George Pentecost*	-	-
William Edwin Keith Piercy	7,500	50
Frank Schon	1,250	-
Richard Evelyn Threlfall	74,659	-
Bryan Topley	10,841	-
Sir Owen Wansborough Jones, K.B.E. [†]	-	-
John Christopher Wilson	115,150	288
<u>Secretary</u> - Christopher Nevil Wilson	331,250	5,050

* Appointed to the board in February 1960.

† Appointed to the board with effect from 1st October 1959.

2. Principal Stockholders

	<u>stockholding at 12.6.59</u>	
	<u>ord.</u>	<u>pref.</u>
The Prudential Assurance Co. Ltd.	858,002	25,000
Church Commissioners for England	430,000	-
Bank of Scotland London Nominees Ltd.	256,406	18,500
Mrs. H. J. Wilson	262,000	3,000
Pearl Assurance Co. Ltd.	250,000	14,000
Kenneth H. Wilson and anor.	255,169	8,160
Kenneth H. Wilson and anor.	255,000	-
Royal London Mutual Insurance Society Ltd.	210,000	14,500

and approximately 8,800 others

VII. ORGANIZATION

1. Administrative

In May 1957 Albright & Wilson Ltd. effected a sweeping administrative change by assuming the role of a holding company, transferring responsibility for its factories to a newly-formed subsidiary, Albright & Wilson (Manufacturing) Ltd., and establishing a central office in London to co-ordinate the financial and secretarial affairs, and the publicity of the whole group. At the head of the group is a board of twelve directors which controls policy and finance but delegates considerable authority in other matters to the executive directors of the subsidiary companies.

2. Productive

Albright & Wilson (Manufacturing) Ltd. is responsible for all the group's productive resources in Britain except those of Marchon Products Ltd. and Midland Silicones Ltd. Separate Divisions for Organic Chemicals and Fine Chemicals have been set up, but these have no executive function and exist merely to signify the association between sections of the manufacturing units engaged in similar activities. Details of all the home factories in the group are given in Appendix 4, page 37.

3. Selling

Albright & Wilson conduct their sales in Britain from an office in London and from branches in Birmingham, Glasgow, Leeds, and Manchester, but each of the principal manufacturing companies in the group also has a selling organization of its own. Clifford Christopherson & Co. Ltd.,

a merchanting company, handles an extensive range of products not made by the group, supplying these to the ceramics, rubber, food, and chemical industries; it is seeking to acquire further agency rights from European manufacturers. The addresses of the group's sales offices are listed in Appendix 4, page 37.

Albright & Wilson maintain a technical service department to advise their customers on the properties and applications of their products. This department is located at Oldbury and is divided into five sections: for detergents, water treatment, food products, metal finishing, and plastics. Marchon Products Ltd. and Midland Silicones Ltd. have their own technical service departments at Whitehaven and at Barry.

Although Albright & Wilson export more than 20 per cent. of their output (in value), and Marchon Products as much as 50 per cent., the group's only selling organization outside Britain is in Eire where a subsidiary company, Goodbody Ltd., operate as retailers. In its markets overseas the group therefore relies almost entirely on agents, among whom are the subsidiaries of I.C.I. listed on page 5.

4. Purchasing

Albright & Wilson place their purchase contracts for all factories in the group through a central buying office at Oldbury. This office comprises four sections: for engineering products, raw materials, packages, and miscellaneous goods.

5. Research and Development

The main research laboratories of the group, at Oldbury, include sections for the separate study of physical chemistry, inorganic chemistry, organic chemistry, process development, and analytical methods. Besides work on new products and their efficient production these laboratories carry out fundamental research for the whole group. In addition, Marchon Products and Midland Silicones have their own laboratories for product development at Whitehaven and Barry. The executive director in charge of Albright & Wilsons' research and development, Mr. Bryan Topley, is chairman of a group development committee which evaluates all capital projects and recruits the staff needed to carry out those approved by the board.

VIII. REVIEW OF MAIN ACTIVITIES

1. Phosphorus

For the extraction of elemental phosphorus - the earliest and still one of the most important of Albright & Wilsons' activities - rock phosphate is heated with silica and carbon in electric furnaces of special design. It is thus reduced to phosphorus (which distils), with the formation of carbon monoxide (which escapes and is burnt) and a siliceous slag (which is discarded). General Chemicals Division have estimated that in 1958 Albright & Wilson produced more than 36,000 tons* of elemental phosphorus, of which half came from Portishead, nearly half from Oldbury, and the balance from the Widnes furnaces (since closed down). The current output is probably 40,000 tons a year.

In Britain the production of phosphorus is expensive, partly because of the incidence of ocean freight charges on the imported rock (which comes mainly from Florida, with a small proportion from North Africa), but chiefly because of the high cost and heavy consumption of electric power, of which 6 kWh are required to liberate 1 lb. of phosphorus. Compared with producers - including their own subsidiary in Canada - to whom cheap hydro-electric power is available, Albright & Wilson are therefore at a considerable disadvantage at their home plants. Nevertheless, under the protection of K.I.D.[/] they have increased the output of these plants threefold in the last ten years and now supply therefrom all the phosphorus consumed in this country.

Phosphorus is normally produced in the white or yellow form, which, in small quantities, is supplied as solid sticks immersed in water, but if required in bulk, can now be delivered as liquid in heat-insulated tanks. For match making, however, white phosphorus must be converted to the amorphous, or red, allotropic modification, which is less reactive and non-poisonous. The conversion is effected (by prolonged heating in closed vessels) by Albright & Wilson Match Phosphorus Co. Ltd.

* This estimate, and several others quoted in this report, are taken from report GC/D/159 (The Albright & Wilson Group) by D. W. F. Hardie dated 9th April 1959.

/ Key Industries Duty: a supplementary tariff protection formerly granted to producers in Britain or the Commonwealth who guaranteed to make 80 per cent. of this country's requirements of strategically important materials. It has now been superseded by the terms of the Import Duties Act of 1958.

2. Phosphoric Acid and Phosphates

Albright & Wilson convert more than 80 per cent. of their phosphorus to orthophosphoric acid. At Oldbury and Widnes the phosphorus is first burnt in air to form phosphorus pentoxide (for which there is a certain demand as such), and the latter is subsequently converted to acid by reaction with water; at Kirkby the conversion is effected more economically by burning the phosphorus in a stream of air under water in a single operation. The phosphoric acid so produced, and the various phosphates derived from it, are of high purity such as is necessary for food products and certain industrial applications. Where a lower standard of purity is acceptable it is possible to use the cheaper 'wet' process of phosphate extraction, i.e. the simple treatment of rock phosphate with sulphuric acid to yield directly a solution of phosphoric acid which, though it contains some impurities, is nevertheless suitable for making detergent phosphates. Marchon Products, who make detergent phosphates exclusively, adopted the 'wet' process at Whitehaven, and Albright & Wilson themselves are considering its use for part of their own production. It is not only unencumbered by heavy power costs, but is applicable to the lower grades of North African phosphate which are unsuitable for the electrothermal process. Albright & Wilsons' output of electrothermal phosphoric acid has greatly increased in the last few years and may now be around 100,000 tons a year (as 100% H_3PO_4). Marchon Products' output by the 'wet' process (as 100% H_3PO_4) is 30,000 tons a year. In addition, Albright & Wilson make 1,000 tons a year of pyrophosphoric acid, most of which they supply to I.C.I. (Billingham Division) for the production of Victor Oxide catalyst.

Albright & Wilson sell considerable quantities of their orthophosphoric acid as such, but convert the bulk of it to a wide range of industrial phosphates, of which the most important are the sodium phosphates. They estimate that their consumption of sodium carbonate in producing these (78,000 tons in 1959) will rise to 83,000 tons a year by 1962.

The principal uses for sodium phosphates are in water treatment and in the manufacture of soapless detergents. For many years, Albright & Wilson have supplied sodium hexametaphosphate ('Galgon') and tetrasodium pyrophosphate ('Tetron') for these applications, but since the war they have undertaken the manufacture of sodium tripolyphosphate to meet the remarkable growth in the demand for this material by the detergent industry. In 1953 they brought plant into operation at Widnes with an annual capacity of 55,000 tons of tripolyphosphate; Marchon Products' output of this material at Whitehaven is 20,000 tons a year.

Among other phosphates made by Albright & Wilson are 5,000 tons a year of monocalcium orthophosphate ('Ibex') and 2,500 tons a year of di-sodium pyrophosphate ('Puron'), both of which are used as leavening agents in bakery, and 3,000 tons a year of ammonium phosphate for use in fire-proofing.

3. Other Phosphorus Compounds

Albright & Wilson make some 6,000 tons a year of phosphorus trichloride, most of which they oxidize to phosphorus oxychloride, an essential intermediate in the production of phosphate esters; and although they sell part of their output, they convert a substantial proportion of it themselves to a range of alkyl and aryl phosphates for use as plasticizers. They make certain other organic compounds, including ethyl aniline phosphate and triphenyl phosphite for the paint industry, and di-alkyl phosphites for conversion to insecticides and spinning assistants for acrylonitrile fibres. They have recently been awarded a contract by the United Kingdom Atomic Energy Authority for the production of specially pure tributyl phosphate which, in admixture with kerosene, is being used to extract uranium nitrate from nitric acid digests. Mention should also be made of their production of phosphorus sesquisulphide for the match industry, and of phosphorus pentasulphide as an oil additive; but these amount only to a few hundred tons a year.

4. Carbon Tetrachloride

Albright & Wilson began the production of carbon tetrachloride in 1914, when they were seeking an outlet for the chlorine released in their electrolytic zinc plant. They subsequently closed the zinc plant, but have continued to manufacture carbon tetrachloride from purchased raw materials. They now make it at Widnes at the rate of 14,000 tons a year, and are increasing their capacity to 18,000 tons a year, primarily to meet the growing demands of I.C.I. to whom they sell 55 per cent. of their output for conversion to chlorinated fluoromethane ('Arcton'). (Its main other uses are as a fire extinguisher, a degreasing agent, and a dry-cleaning solvent.)

Both the chlorine and the carbon disulphide from which the carbon tetrachloride is made are supplied by I.C.I., who take back some 4,750 tons a year of sulphur recovered during the process. In 1958 I.C.I. made reductions in the charges for these materials to help Albright & Wilson to compete with cheap imports of carbon tetrachloride from Canada.

5. Detergents*

Marchon Products, at Whitehaven, make substantial quantities of organic detergent chemicals which they supply, either direct, or mixed to their customers' specifications. They prepare and pack 'Fab' for Colgate-Palmolive Ltd., and 'Spel' for the Co-operative Wholesale Society Ltd.; and although their share of the detergent-powder market is probably no more than 5 per cent. they are the only makers of such products in Britain apart from Unilever and Thomas Hedley. They produce the sulphated fatty alcohols and esters ('Empicols') upon which some of these preparations are based by the hydrogenation of natural oils and fats and subsequent treatment with sulphuric acid, but their 'Nansa' alkyl aryl sulphonates are made - also by treatment with sulphuric acid - from dodecyl benzene obtained from Grange Chemicals Ltd. They supply sulphated fatty alcohols mixed with fatty acid alkylolamides[†] to Domestos Ltd. for incorporation in 'Bubbly Stergene', and treat a further quantity with ethylene oxide[‡] for Thomas Hedley and for incorporation in their own detergent preparations.

6. Oil Additives

The addition of chemicals (in small proportions) to mineral lubricants to increase their stability or improve their action is now general practice. Albright & Wilson have sold phosphorus pentasulphide as a preventative of corrosion and carbon deposition within the cylinders of internal combustion engines for many years. In 1944 they obtained a licence from the Lubrizol Corporation of America to manufacture the entire range of that company's oil additives, which, under the trade name 'Anglamol', they now market through a jointly-owned company, Lubrizol (Great Britain) Ltd.; the business has brought them a fairly substantial and expanding return.

* A detergent is a substance possessing surface-active properties and capable of removing dirt from soiled articles. When added to washing water it reduces the surface tension between the water and the dirt, thereby facilitating the displacement of the latter. Soap is the most familiar example. The more recently discovered soapless detergents - especially those sold in powder form - are commonly used in conjunction with other chemicals. These include sodium phosphates, which improve their action, bleaches (both chemical and optical), foaming agents, and sodium sulphate, which serves as a cheap filler.

† Condensates of lauric acid with one molecule of monoethanolamine or two molecules of isopropanolamine.

‡ In mid-1959, Marchon Products were using ethylene oxide for this purpose at an annual rate of 600 tons.

Many of the 'Anglamol' products are organic phosphates which Albright & Wilson did not previously make, and some are not derived from phosphorus at all. The range is supplemented by acrylic viscosity-index improvers of which Marchon Products make about 1,000 tons a year from I.C.I.'s methyl methacrylate on behalf of C. C. Wakefield & Co. Ltd. The rate of production of the 'Anglamols' has not been estimated but Albright and Wilson are undoubtedly one of the principal manufacturers of oil additives in this country, and they are known to have plans to increase their output. They use substantial quantities of isobutyl alcohol supplied by I.C.I., and they have introduced other I.C.I. products to the Lubrizol Corporation who are seeking to standardize the additives made in their plants in Canada, Britain, France, and Mexico. Thus, in 1957, Lubrizol approved the use of I.C.I.'s 'Cereclor', of which they expect Albright & Wilson to consume 1,800 tons in 1960, and of which their total requirements in Canada, France, and Mexico may amount to a further 1,000 tons. More recently they have been evaluating I.C.I.'s heptyl-phenol as a possible substitute for their own material in the manufacture of additives, and estimate that by 1961 they will be consuming 300 tons a year of this in Britain alone with the possibility of additional quantities in Canada and France.

7. Silicones*

Midland Silicones Ltd. (the subsidiary which Albright & Wilson own jointly with Dow Corning Corporation of America), whose factory is at Barry, Glamorgan, are the largest manufacturers of silicones in Europe. Their main products are methyl silicones of which, in terms of siloxane content (see below), they now make more than 630 tons a year. They also make about 50 tons a year of phenyl silicones and have recently begun to make very small quantities of vinyl silicones. The essential raw materials are elemental silicon (of French or Swedish origin) and the appropriate hydrocarbon chlorine derivative, which, for the methyl silicones, is methyl chloride. It is believed that 100 tons of methyl chloride yield 42.5 tons of methyl siloxane; and from this and the company's known intake of methyl chloride (which I.C.I. supplies exclusively) the following table has been calculated:-

* The basic chemical structure of the silicones is a chain of alternate atoms of silicon and oxygen (the siloxane chain) with hydrocarbon radicals attached to each silicon atom. For practical purposes silicones are marketed in admixture with various solvents or fillers so that the final products contain, on the average, only 61 per cent. of siloxane.

Midland Silicones Ltd. : Output of Methyl Silicones
Based on Consumption of Methyl Chloride

Year	Consumption of methyl chloride	Production of methyl siloxane	Equivalent output of methyl silicones (61% siloxane content)
1954	187	80	131
1955	438	186	305
1956	573	243	399
1957	1,164	495	811
1958	880	374	613
1959	1,500	637	1,044

In terms of siloxane content, Midland Silicones' total output probably amounted to 670 tons in 1959. They originally designed their plant to make 600 tons a year; but by modification and improvement they have increased its capacity to a maximum, of possibly 800 tons a year, which (from estimates of their future requirements of methyl chloride) they expect to achieve by 1961. They have plans under consideration to increase their output thereafter by the installation of new plant.

Although, among many useful properties, silicones have the ability to withstand extremes of temperature, to resist oxidation, to repel water, and to serve as electrical insulators, the demand for them has been rather slow to develop in Britain, mainly because in all their present applications they are required in comparatively small amounts. Midland Silicones are therefore constantly seeking to discover some new and large-scale outlet for their products. They export 20 per cent. of their present output.

8. Strontium Salts

Bristol Mineral & Land Co. Ltd., a subsidiary of Albright & Wilson, own and excavate extensive deposits of celestine (strontium sulphate) at Yate, near Bristol. These deposits are of exceptional purity and constitute one of the most important sources of strontium in the world. Much of the output of more than 6,000 tons a year is sold, substantial amounts being exported to America and elsewhere; the remainder is converted by Albright & Wilson to strontium chloride (for use in certain processes for the case-hardening of steel), and to strontium nitrate (for pyrotechnics and sugar-refining). Finely ground celestine can also be used instead of barytes as a filler in the manufacture of paints and rubber goods, and the company sell small amounts for this purpose.

9. Sulphuric Acid and Cement

In the production of phosphoric acid by the 'wet' process, and in the manufacture of detergents, Marchon Products consume large quantities of sulphuric acid. This is supplied entirely by Solway Chemicals Ltd., the subsidiary which Marchon established for that purpose shortly after their own formation. Solway make more than 100,000 tons of acid a year (as 100% H₂SO₄) from anhydrite, of which there are extensive beds beneath the Marchon factory at Whitehaven. The cement clinker which is simultaneously produced is sold to The Associated Portland Cement Manufacturers Ltd. under a long-term agreement.

For a time, at the beginning of the venture, surplus quantities of Solway acid came upon the market at very low prices, but the entire output is now consumed internally. Marchon's plans (announced in 1959) to raise it to 150,000 tons a year are unlikely to go beyond the extra requirement entailed by Albright & Wilsons' intended increase in the use of the 'wet' process.

10. Other Products

Albright & Wilson manufacture on a comparatively small scale a number of miscellaneous products, some of which are listed in Appendix 5, page 38. Among the more important of these are chlorobromomethane, a fire-extinguishing chemical, of which they make 100 tons a year from methylene chloride supplied by I.C.I.; and thioglycollic acid, used principally in 'home-perm' preparations. In 1959 they approached I.C.I. for chloroacetic acid from which to make the latter, suggesting that they might need 200 tons a year. In 1957, in association with The Bradford Dyers' Association Ltd., they introduced tetrakis hydroxymethyl phosphonium chloride which, mixed with an amine formaldehyde resin, gives a durable anti-flame finish to textiles; it is marketed by a jointly-owned company, Proban Ltd.

Albright & Wilson make many products for the plastics industry. In addition to the organic phosphate plasticizers mentioned on page 16, they manufacture resin-curing catalysts to promote the curing of urea- and phenol-formaldehyde resins at relatively low temperatures. They also produce (under American licences) the 'Mellite' range of organo-tin compounds, and a few organic derivatives of barium and cadmium, all of which are used as stabilizers in the manufacture of polyvinyl chloride.

11. Metal Finishing Processes

Among the many industrial applications of phosphoric acid are the rust-proofing, polishing, and plating of metals. Under the name 'Phosbrite', Albright & Wilson manufacture a range of chemical polishes for non-ferrous metals. These are mixtures of phosphoric acid with other acids, originally developed for brightening aluminium and its alloys, but now available also for brass, copper, and nickel silver.

In 1956, Albright & Wilson became the sole licensees in Britain, Eire, and Denmark of the 'Kanigen' plating process developed by the General American Transportation Corporation. In this process, a hard, non-corroding nickel-phosphorus alloy containing 8 per cent. of phosphorus is deposited on aluminium and on certain qualities of steel by the catalytic reduction of a nickel salt in a hypophosphite solution. Albright & Wilson operate the process at Oldbury where they are successfully applying it to chemical valves, heat exchanger tubes, and other engineering components of intricate design. Another American technique which they operate under licence is a nickel electroplating process called 'Plusbrite'.

12. Water Treatment Service

The use of soluble phosphates for the treatment of water fed to steam boiler plants, as well as for the conditioning of water within the boiler, to prevent scale deposition has long been practised. Besides di- and tri-sodium phosphates, Albright & Wilson sell a number of special products for this and similar purposes: 'Calgon', a complex mixture of polymetaphosphates and polyphosphates; 'Calgonite', a similar material intended primarily for detergent uses; 'Micromet', a sodium/calcium phosphate of low solubility; and 'Hagevap', a mixture of a phosphate with a surface-active agent for use in evaporators. I.C.I. buys 'Calgon' and di-sodium phosphate for incorporation in 'Alfloc' preparations and for direct use in its own high-pressure boilers*; but while it is generally recognized that phosphate conditioning is essential at high pressures, the use of phosphates in boilers operated below 250 p.s.i. is declining in favour of an improved method of carbonate conditioning which is both cheaper and more effective^f.

* In 1958 the quantities taken were: 'Calgon', 1070 tons; di-sodium phosphate, 300 tons. 94 per cent. of the total went into 'Alfloc' preparations.

^f For a description of this new and important procedure, which is the outcome of research by I.C.I. Alkali Division, see 'Boiler Water Treatment : A Formula for the Control of Sludge and Scale in Internal (Carbonate) Treatment'; papers by J. A. Gray, and by E. F. Thurston and L. Furnival in J.Inst.Fuel 1957, 30, 577 to 591. Also 'A New Development in Boiler Water Treatment' by N. H. Peters, The Steam Engineer, July 1958.

For the protection of boilers against internal corrosion, Albright & Wilson market a product called 'Hagafilm', which is essentially a film-forming amine. They import this from Hagan Chemicals & Controls Inc., U.S.A., of which the Calgon Company is a Division and from whom they obtained manufacturing rights for 'Calgon', 'Calgonite', and 'Hagevap'. 'Hagafilm' is directly competitive with 'Alfloc' No. 19 Dispersion.

13. Research and Development

Among the principal results of their researches during the last few years have been the organic phosphorus compounds which Albright & Wilson now sell as oil additives, plasticizers, flame-proofing chemicals, and insecticides; and certain phosphonitrilic polymers (resulting from the reaction of phosphorus pentachloride with ammonium chloride) which, when treated with either butylamine or alcohol, are said to yield resins and plastics possessing exceptional heat-resisting properties. They began to distribute samples of phosphonitrilic chloride polymers in 1958.

In an attempt to reduce their production costs, Albright & Wilson have conducted experiments in the reaction of phosphoric acid with salt in place of soda ash to produce sodium phosphates, and they have considered converting to methanol the 60,000 tons a year of carbon monoxide which is a by-product from their phosphorus furnaces. Midland Silicones, who have available substantial quantities of by-product hydrochloric acid which at present goes to waste, are actively considering the use of this acid in reaction with methanol to make their own requirements of methyl chloride. None of these ideas has yet been adopted on a commercial scale.

In 1958, Albright & Wilson discussed with I.C.I. the possibility of obtaining a licence to manufacture the 'Phoryl' adhesives and 'Phorosol' emulsifying and anti-corrosive agents (organic compounds of phosphorus) which I.C.I. had previously withdrawn from its range of development chemicals. Although they subsequently decided not to manufacture these products in Britain, they are still examining with Hooker Chemical Corporation the possibility of taking out a licence to make them in America and Canada. They have also had discussions recently with I.C.I. on the use of certain organo-tin compounds as stabilizers and fungicides; but the situation is complicated by an agreement which they have with the Metal & Thermit Corporation of America to sell and develop that Corporation's butyl and vinyl tin compounds.

Albright & Wilson claim to have discovered a new method for preparing phosphine, a gas with possible industrial applications.

Marchon Products are believed to be constructing a plant to make sodium silicofluoride (from the gases released during the production of phosphoric acid by the 'wet' process) at the rate of 2,000 tons a year, and they have recently approached several of I.C.I.'s customers with samples of this material. Among other products being developed by Marchon are a range of detergents of the alkyl phenol/ethylene oxide condensation type (which would be competitive with I.C.I.'s 'Lissapol' N), and sulphamic acid.

IX. COMPETITION AND RELATIONS BETWEEN ALBRIGHT & WILSON AND I.C.I.

Except in silicones and in sodium phosphates for water treatment, competition between Albright & Wilson and I.C.I. is small. There is little rivalry with organic phosphates and chlorinated solvents. Formerly there was keen competition with Marchon Products in sulphuric acid, but their output is now largely being consumed internally in the manufacture of phosphoric acid. Marchon's decision to make sodium silicofluoride (which I.C.I. alone have produced hitherto in Britain) is potentially competitive, but is thought unlikely to have appreciable impact. At present, Albright & Wilsons' inorganic phosphates are of higher quality than the agricultural phosphates made by I.C.I. and are applied to different uses, but competition between the companies in phosphates may be expected to grow.

The competition in silicones, already marked, will be intensified. Midland Silicones started production in 1954 and now make 80 per cent. of the country's output; I.C.I., with 20 per cent., started production in 1955. Both companies intend to increase their output substantially during the next few years. In supplying for non-technical uses (e.g. in polishes and mould-release agents) Midland Silicones have always enjoyed the advantage over I.C.I. of prior entry; and being unable to appeal to their customers on grounds of quality they have often forestalled I.C.I.'s approach by anticipatory reductions in price. It is difficult for I.C.I. to attract orders from such customers, whose business is often not large enough to share between two suppliers. For the more technical applications of silicone rubbers and resins by the aircraft and electrical industries, a lack of suitable products at one time limited I.C.I.'s ability to compete, but intensive research at Ardeer has now put I.C.I. on almost equal terms with Midland Silicones. For textile applications, I.C.I.'s silicones are markedly superior to those of Midland Silicones.

Albright & Wilson sell 'Calgon' and other sodium phosphates in competition with I.C.I.'s 'Alfloc' products for the treatment of water. They are firmly established in water treatment for high pressure boilers; but since they provide a less comprehensive technical service than the 'Alfloc' Water Treatment Service they have little custom beyond the power stations of the Central Electricity Generating Board, the National Coal Board, and the larger industrial companies.

Up to 1957 the fields of interest of the companies were defined and each undertook to inform the other of any plans to enter the other's field. The abrogation of this agreement by mutual consent, did not, of itself, affect the relations between the companies; but subsequent developments have led to a decline in their long-standing accord for which (to be fair) I.C.I. have not been entirely blameless. Albright & Wilson have not forgotten their anxiety over I.C.I.'s chlorine policy some years ago, from which they only secured relief on the plea that a large part of their chlorine intake was used in producing carbon tetrachloride for I.C.I. They were disturbed when I.C.I. entered the silicones field (in which they think there is room in the U.K. for only one producer) after having left it clear for them, as they thought, by refusing the Government's invitation to manufacture. They were also aggrieved when S.A.I. took up the manufacture of monoammonium phosphate discontinued by Billingham Division, after they had been led to expect that the business would be passed to them. They are, in consequence, much readier than formerly to accept the advances of I.C.I.'s competitors, to whom, in recent years, they have transferred orders for salt, oxalic acid, and chloroacetic acid; and recently I.C.I. have been under strong competitive pressure from Murgatroyd's Salt & Chemical Co. Ltd. for their business in chlorine and caustic soda. Despite all this, contact with their board (especially with the senior members) and with other responsible officials is friendly.

X. ALBRIGHT & WILSON IN THE EUROPEAN MARKETS

The total value of Albright & Wilsons' exports exceeds £8 million a year, but only a small proportion goes to the six countries of the European Common Market. Since the combined capacity of those countries for making the products concerned is probably more than sufficient for their future requirements, this part of the company's trade is likely to be lost.

Albright & Wilsons' exports to the seven nations of the Free Trade Area are also on a modest scale. Their business is likely to be affected by the gradual removal of trade barriers between those nations in two ways. In Britain they will get less and less protection from the very high tariffs which their competitors in the Free Trade Area now pay, while both in Britain and in the other member countries they will meet increasingly severe competition from manufacturers in Western Germany and France fighting to maintain their present fairly substantial exports of phosphoric acid, sodium phosphates, and silicones. They have expressed confidence in their ability to hold these markets, but it seems clear that they will have to reduce the prices of many of their products in order to do so. Their principal competitor in the Free Trade Area, Reymersholms Gamla Industri Akt. of Sweden, is favourably placed to supply the phosphorus products which the Scandinavian countries at present import from the Common Market. Austria and Switzerland, both of which also import fairly large amounts of phosphorus chemicals from Common Market countries, may be prevented by political and other considerations from changing their sources of supply; but in any event, the import tariffs which they now levy on these products are so small that Albright & Wilson would gain little from their removal.

Marchon Products are in a more advantageous position in the Free Trade Area than Albright & Wilson because they already export substantial quantities of detergent chemicals to Switzerland. They will probably retain this business; and they intend to manufacture detergents in Italy by the end of 1960, thus also gaining access to the countries of the Common Market.

Midland Silicones do not export their products to France or to Germany, but they make substantial exports to the Netherlands and Belgium. As the general rates to be charged by the Common Market come into effect the duties levied on silicones by the Benelux countries will be considerably increased; but there is reason to think that Midland Silicones, in their anxiety to maintain their sales to those countries, may keep their prices competitive by absorbing the additional tariffs. In 1959, in association with Nederlandsche Verkoopkantoor Voor Chemische Production, they established a company in Holland to exploit their textile finishes.

XI. FUTURE PROSPECTS

In recent years, Albright & Wilson have spent considerable sums on increasing their manufacturing capacity to meet the rapid growth of the demand for industrial phosphates. By analogy with developments in America, this growth will continue in Britain,

particularly in the demand for the detergent phosphates which already form a large part of the group's output. Despite the threat of competition from producers in the Free Trade Area (see page 25), Albright & Wilson can therefore view their prospects in the home market with some confidence; and they are likewise favourably placed to benefit from the expected growth of demand for these products in Canada and Australia.

In order to strengthen their competitive position in the Free Trade Area, they have studied methods to reduce the costs of manufacturing phosphates in Britain (apart from benefits that will accrue from higher output alone); they have under construction a cargo ship which will enable them to carry all their own imports of phosphate rock, and are considering the greater use of the comparatively cheap 'wet' process for phosphoric acid production.

They can probably look forward in Britain to a moderate increase in the consumption of phosphoric acid for the rust-proofing, brightening, and plating of metals, and in the usage of inorganic phosphates in foodstuffs and fire-proofing preparations; but it is thought unlikely that their efforts in recent years to discover new products will significantly increase their business. It is difficult to foresee any appreciable sale for the sulphamic acid which they are proposing to make, or for their sodium silicofluoride; and even if they can exploit their recently developed phosphonitrilic chloride polymers, many years will elapse before they can produce them on a substantial scale. The organic phosphates which they sell as plasticizers compare unfavourably in both price and quality with the phthalate plasticizers. This may have actuated them in their recent bid for Boake Roberts; but the latter company's loss of trade in phthalate plasticizers* must offset any advantage they hope to gain from the merger.

Albright & Wilson are increasing their capacity to make carbon tetrachloride (see page 16) and are therefore particularly concerned at the impending manufacture of this product by Courtaulds, who intend to bring into operation in mid-1960 a plant with an annual capacity of 5,000 tons, and are believed to have obtained orders to supply 60 per cent. of that quantity to Imperial Smelting Corporation Ltd. - Albright & Wilsons' second largest customer. In making carbon tetrachloride, Courtaulds will enjoy the advantage of being able to use recovered carbon disulphide from their viscose process.

* See report No. 59021/HO/SC, page 11.

Midland Silicones have suffered, during the last few years, from the dumping of Continental silicones in Britain, and the anti-dumping order of January 1958, which did not entirely restrain the principal offender, Rhône-Poulenc of France, has been rescinded. Nevertheless they hope that the continually increasing demand will enable them to increase their output.

XII. PRINCIPAL SUBSIDIARY AND ASSOCIATED COMPANIES IN GREAT BRITAIN

Albright & Wilson Ltd. has nineteen subsidiary or associated companies in Great Britain. The three most important of these are described below: details of the others are summarized in Appendix 2, page 35.

1. Albright & Wilson (Manufacturing) Ltd.

This privately-owned company was registered in 1957 to assume responsibility for the factories previously operated by Albright & Wilson Ltd. at Oldbury, Portishead, Kirkby, Widnes, and London. Its registered office is at Oldbury, Birmingham.

Capital

<u>Authorized</u>	<u>Issued</u>
£50,000 in ordinary shares of £1	£45,000

Directors

Maurice James Antcliff
James Kelvin Bottomley
Wilson Carter
Alfred Henry Loveless
Albert Victor Sherwood
Leslie William Stubbs
Christopher Nevil Wilson
Secretary - Ronald Talbot

Shareholders

shareholding at 1.4.59

Albright & Wilson Ltd.	44,998
W. B. Albright	1
J. C. Wilson	1

2. Marchon Products Ltd.

Marchon Products is the third largest manufacturer of soapless detergents in Britain. It was founded in 1939 by Frederick Marzillier and Frank Schon who, in 1947, moved their original plant from London to Whitehaven. The factory at Whitehaven stands above extensive beds of anhydrite which the company mine and convert to sulphuric acid and cement clinker.

By treating imported phosphate rock with the acid (and then with caustic soda) they can make some 20,000 tons a year of sodium tripolyphosphate. They also manufacture sulphated fatty alcohols and a range of alkyl aryl sulphonates.

Marchon Products, who were formerly in competition with Albright & Wilson as producers of sodium tripolyphosphate, became a wholly-owned subsidiary of the latter company in 1955.

The registered office of Marchon Products is at 140 Park Lane, London, W.1.

Capital

<u>Authorized</u>	<u>Issued</u>
£735,000 in ordinary shares of £1	£700,000
In addition, the company has borrowed £545,814.	

Directors

shareholding at 12.3.59

Frank Schon	-
Frederick Marzillier	-
Arthur Clare Halfpenny	-
Otto Secher	-
Rt. Hon. Arthur Creech Jones	-
John Clifford Christopherson	1
Sir Henry Thomas Tizard	-
Peter Baines	-
Robert Christie Dickie	-
Secretary - Lowson (London) Ltd.	-

Other Shareholders

Albright & Wilson Ltd.	699,998
Sydney Barratt	1

3. Midland Silicones Ltd.

Midland Silicones Ltd. was formed jointly in 1950 by Albright & Wilson (who have the controlling interest) and the Dow Corning Corporation of America to manufacture under licence in Britain the Corporation's range of silicone products. In its factory at Barry, Glamorgan, Midland Silicones now manufactures 80 per cent. of the silicones made in this country. It has plans to expand its output during the next few years.

The registered office of Midland Silicones is at 68 Knightsbridge, London, S.W.1.

Capital

<u>Authorized</u>	<u>Issued</u>
£ 400,000 in 5% cumulative redeemable preference shares of £1	£ 400,000
£ 750,000 in ordinary shares of £1	£ 750,000
<u>£1,150,000</u>	<u>£1,150,000</u>

Directors

Edward John Tucker
William Beaumont Albright
Sydney Barratt
Kim Andrew Michael Barton
Charles Bernard Evans
Raeburn Arthur Gregory
Shailey Linwood Bass)
William Ralph Collings) American
Ira Walter Hutchinson, Jnr.) citizens
Robert Joshua Breyfogle
William Edwin Keith Piercy
Secretary - George Edward Walters

Shareholders

	<u>shareholding at 1.4.59</u>	
	<u>pref.</u>	<u>ord.</u>
Albright & Wilson Ltd.	240,000	450,000
Dow Corning Corporation, U.S.A.	160,000	300,000

XIII. SUBSIDIARY AND ASSOCIATED COMPANIES OVERSEAS

Albright & Wilson have substantial interests overseas, including eight subsidiary and associated companies. The four most important of these companies are described below: details of the others are summarized in Appendix 2, page 35.

1. Canada

The Electric Reduction Company of Canada Limited (ERCO)

Albright & Wilson formed this wholly-owned subsidiary in 1935 to take over a phosphorus plant at Buckingham, Quebec, in which they had held a controlling interest for more than thirty years. Since the Second World War the demand for phosphorus and its compounds has grown rapidly in Canada; Albright & Wilson have spent more than \$26 million on expanding their productive capacity there, and the total value of their Canadian plants now represents one-fifth of the assets of the whole group.

To meet the requirements of the Canadian detergent industry, ERCO built a supplementary phosphorus plant at Varennes, near Montreal, in 1953, and they have recently started to erect a large factory (to be completed in 1960) at Port Maitland for the manufacture of phosphoric acid and sodium phosphates. In 1959 they purchased another factory at Port Maitland where they are now making agricultural phosphates. ERCO also produce substantial quantities of sodium chlorate; they have expanded their capacity for making this at Buckingham, and in 1957 they brought into operation a new chlorate plant at Vancouver, B.C. Until a few years ago the principal outlet in Canada for sodium chlorate was in the production of weedkillers; but the paper industry now uses

large quantities of it as a source of chlorine dioxide for bleaching purposes. It is also used in the processing of uranium ore.

The registered office of ERCO is at 137 Willington Street, Toronto.

Capital

The authorized capital is \$6 million, consisting of 10,000 5% redeemable preference shares of \$100, and 50,000 common shares of \$100.

Officers and Directors

Dr. D. E. Jones (president)
R. M. Maunsell (vice-president)
C. L. Watson (secretary and treasurer)
H. F. Ade (assistant secretary)
R. D. R. Jones
C. Russel McKenzie
J. Seath
S. Smith
Dr. E. L. Whitford

2. Australia

Albright & Wilson (Australia) Pty. Ltd.

This company, owned jointly by Albright & Wilson (who predominate) and I.C.I.A.N.Z., was formed in 1939 to operate a plant at Yarraville, Victoria, for the manufacture of phosphoric acid and a small range of phosphates. Having had difficulty early in the war in importing phosphorus, the company erected its own phosphorus smelting furnace at Yarraville in 1942; it brought another furnace into operation in 1954, and now has a third under construction. Concurrently with these developments the company has greatly increased the range of its phosphates (both organic and inorganic), and is considering the establishment of another centre of production, possibly in New South Wales. In 1958, it undertook the production at Yarraville of the range of detergent sulphonates previously exported to Australia by Marchon Products Ltd.

In 1954, the company, whose products were previously handled by I.C.I.A.N.Z., set up its own selling organization in Australia and New Zealand. It is the selling agent for the silicones and alginates imported into these countries from Albright & Wilsons' associated companies in England.

The registered office of the company is at 610 St. Kilda Road, Melbourne.

Capital

<u>Authorized</u>	<u>Issued</u>
£A.500,000	in shares of £A.1
	£A.300,000

Directors

Dr. H. W. Strong	D. Rist)
W. B. Albright	D. J. W. Anthony)
R. C. Edquist	W. M. Michelmore	alternate
J. R. A. Glen*	L. W. Weickhardt	directors
A. Sorensen*	Y. B. Swanson)

Shareholders

	<u>shareholding</u>
Albright & Wilson Ltd.	172,500
I.C.I.A.N.Z.	127,500

3. Ireland

Albright & Wilson (Ireland) Ltd.

Albright & Wilson formed this subsidiary company in 1935 to build and operate a factory which they were about to establish on a site of $3\frac{1}{2}$ acres at Dun Laoghaire, near Dublin, for the production of food phosphates. Besides these, and various fine chemicals, the company's output now includes certain household cleaning products made under licence from firms outside the Albright & Wilson group.

The address of the company's factory and registered office is Ibex Works, Dun Laoghaire, Co. Dublin.

Capital

<u>Authorized</u>	<u>Issued</u>
£ 30,000 in 6% cum. preference shares of £1	£20,000
£ 17,500 in 'A' ordinary shares of £1	£15,000
£ 52,500 in 'B' ordinary shares of £1	£45,000
<hr/>	<hr/>
£100,000	£80,000
<hr/>	<hr/>

Directors

	shareholding at 24.6.58		
	6% pref.	'A' ord.	'B' ord.
J. W. Freeman, chairman	4,100	-	-
N. R. Goodbody, managing director	-	-	-
M. J. Antcliffe (British)	-	-	-
G. W. O'Brien	-	-	-
E. P. Freeman	-	-	-
W. B. Albright (British)	-	-	-
P. E. Greville (British)	-	-	-
V. P. Goodbody	-	-	-

Principal Shareholders

Albright & Wilson Ltd.	7,600	15,000	13,500
Ibex Ltd. /	4,000	-	31,500

* Appointed by I.C.I.

/ Probably controlled by Albright & Wilson Ltd.

4. United States of America

Hooker Chemical Corporation

Albright & Wilson have a small interest (6 per cent.) in Hooker Chemical Corporation which they accepted in 1956 in exchange for all the share capital of their American subsidiary, Oldbury Electro-Chemical Co. Inc. They had formed that company in 1896 to operate a plant at Niagara Falls, and for the next forty years it supplied a proportion of the group's phosphorus. In 1933, however, Albright & Wilson transferred some of its production to their plants in England; and they substantially increased their capacity for making phosphorus both in England and in Canada after 1945, with the result that Oldbury Electro-Chemical Co. Inc. became increasingly dependent on the American home market. To enable it to compete with the large firms in that country, however, Albright & Wilson would have needed to provide it with additional capital and they therefore sold it to Hooker Chemical Corporation who offered 378,000 of its shares (valued at more than \$18 million) for the assets.

Hooker owns several large factories in America for the electrolysis of brine (the largest is at Niagara Falls), and makes phenolic plastics. Its issued capital consists of 50,000 cumulative (\$4.25) preference shares of no par value and 6,460,486 common shares of \$5 each. The chairman of the Corporation is R. L. Murray; its president is T. E. Moffitt; and one of the vice-presidents is Dr. E. L. Whitford, formerly president of Oldbury Electro-Chemical Co., who now has special responsibility for the Corporation's research programme.

In 1958, Hooker granted to Albright & Wilson an exclusive licence in Western Europe, Australia, New Zealand, and South Africa for the manufacture and sale of a range of flame-resistant polyester resins called 'Hetron'.

SIGNED: J. G. MORRIS
MIDLAND REGION

Appendix 1

Directors of Albright & Wilson Ltd.
Board Appointments and Personal Notes

Board Appointments

William Beaumont Albright
Albright & Wilson Ltd. (vice-chairman)

Sydney Barratt, B.A.
Albright & Wilson Ltd. (chairman)

Wilson Carter
Albright & Wilson Ltd.

John Clifford Christopherson, B.A.
Albright & Wilson Ltd.
Chipman Chemical Co. Ltd.
Clifford Christopherson & Co. Ltd.
Marchon Products Ltd.
Solway Chemicals Ltd.

Neil Malcolm Peech
Steetley of Canada Ltd. (chairman and president)
Steetley Co. Ltd. (chairman and managing director)
Canada Crushed and Cut Stone Ltd. (chairman)
Albright & Wilson Ltd.
Sheepbridge Engineering Co. Ltd.
Solway Chemicals Ltd.

Frederick George Pentecost
A. Boake, Roberts & Co. (Holding) Ltd. (chairman)
A. Boake, Roberts & Co. Ltd. (chairman)
Shawinigan Ltd. (chairman)
Albright & Wilson Ltd.

William Edwin Keith Piercy, B.Sc.
Albright & Wilson Ltd.
Midland Silicones Ltd.
Proban Ltd.

Frank Schon
Marchon Products Ltd. (chairman)
Solway Chemicals Ltd. (chairman)
Albright & Wilson Ltd.
Astoria Shipping & Transport Co. Ltd.

Richard Evelyn Threlfall, M.A.
Albright & Wilson Ltd.
George N. Richards Ltd.
Grainger & Threlfall Ltd.
Newton Photograph Services Ltd.
Plowden and Thompson Ltd.

Bryan Topley, M.A.
Albright & Wilson Ltd.

John Christopher Wilson, M.A.
Albright & Wilson Ltd.

Kenneth Henry Wilson, O.B.E., J.P.
Albright & Wilson Ltd. (president)
Bryant & May Ltd. (deputy chairman)
British Match Corporation Ltd.
Century Insurance Co. Ltd.
Friends' Provident and Century Life Office

Personal Notes on Some of the Directors

William Beaumont Albright After serving for many years as managing director of the company, he was appointed vice-chairman in 1955 with special responsibility for overseas affairs.

Sydney Barratt Born in 1898. Educated at Clifton School and Balliol College, Oxford. He became Lecturer at Leeds University and then at University College, London, before joining Albright & Wilson Ltd. in 1932 as assistant research director; he subsequently succeeded Sir Richard Threlfall as director of research. Appointed to the board in 1938; managing director in 1955; and chairman in 1957.

Wilson Carter Joined Albright & Wilson Ltd. in 1940 and subsequently became production manager. Appointed to the board in 1958.

John Clifford Christopherson Born 1909. Educated at Uppingham School and Pembroke College, Cambridge. He became a director of Albright & Wilson Ltd. in 1942.

Frank Schon Born in Austria. In 1939 he was joint-founder (with F. Marzillier) of Marchon Products Ltd.; appointed to the board of Albright & Wilson Ltd. in 1956.

Richard Evelyn Threlfall Educated at Oundle School and Caius College, Cambridge. Appointed to the board of Albright & Wilson Ltd. in 1949.

Bryan Topley Born 1901. Educated at Whitgift School and Trinity College, Cambridge. He joined Albright & Wilson Ltd. in 1936 as director of research after succeeding S. Barratt (see above) as Lecturer at Leeds University and then at University College, London. He was appointed to the board in 1944.

John Christopher Wilson Younger brother of the company's president, K. H. Wilson. He graduated at Cambridge in 1913 and joined Albright & Wilson Ltd. in 1919; appointed to the board in 1921.

Kenneth Henry Wilson Born in 1885. Educated at Marlborough and Trinity College, Cambridge. He joined Albright & Wilson Ltd. in 1908; became its chairman in 1932, and assumed the newly-created office of president in 1958. He was a founder member, and later chairman, of the Association of Chemical and Allied Employers. Mayor of Oldbury in 1935, and a member of Worcestershire County Council since 1936; he was High Sheriff of Worcestershire from 1948 to 1949. Awarded O.B.E. in 1949.

Sir Owen Wansborough-Jones Born in 1905. Educated at Gresham's School and Trinity Hall, Cambridge. Scientific Adviser to the Army Council from 1946 to 1951, and Chief Scientist to Ministry of Supply since 1953. Created K.B.E. in 1955.

Appendix 2

Albright & Wilson Ltd.
Minor Subsidiary and Associated Companies

Company	Location	Total Issued Capital	Percentage of ordinary capital held by			Main Product or Activity	Remarks		
			Albright & Wilson Ltd.	Other shareholders					
				%	Shareholder				
<u>HOME</u>									
Alginate Industries Ltd.	London	£127,551	6	52	Four nominees	Alginates (from seaweed) marketed as 'Manucols'			
Albright & Wilson Match Phosphorus Co. Ltd.	Oldbury	£40,000	50	50	The British Match Corporation Ltd.	Amorphous phosphorus			
Antelope Co. Ltd.	London	*	*			Distribution of baking chemicals			
Astoria Shipping & Transport Co. Ltd.	Whitehaven	£100,000	100			Transport services	* Details not available		
Bristol Mineral & Land Co. Ltd.	Chipping Sodbury	£6,000	84			Celestine (strontium ore)			
Chipman Chemical Co. Ltd.	London	£30,000	17	(34	Chipman Chemical Co. Inc. (U.S.A.)	Distribution of weedkillers. Holds the patents for 'Attacide', a mixture of sodium chlorate with other chemicals (to reduce the fire hazard) which Plant Protection Ltd. sells on its behalf			
				{ 17	Plant Protection Ltd.	Chemical merchants			
				{ 17	Staveley Iron & Chemical Co. Ltd.				
				{ 12	Atlas Preservative Co. Ltd.				
Clifford Christopherson & Co. Ltd.	London	£10,000	100			Wholesale distribution of firelighters			
Cumbria Trading Co. Ltd.	Whitehaven	£200	100			Life-saving equipment, including distress signals based on calcium phosphide			
Holmes Marine Life Protection Association Ltd.	Oldbury	£3,000	100			Distribution of Lubrizol oil additives manufactured by Albright & Wilson			
Lubrizol (Great Britain) Ltd.	London	£1,825	30	(55	Lubrizol Corporation (U.S.A.)	Distribution of silicones			
				(15	Alfred Towle, a director (British)	Chemical merchants	* Through Midland Silicones Ltd.		
Midland Silicones (Sales) Ltd.	London	£20,000	100*			Distribution of flame-proofing chemicals			
Keith Piercy Ltd.	London	£503	100			Distribution of tartaric acid			
Proban Ltd.	Oldbury	£1,000	50	50	The Bradford Dyers' Association Ltd.	Production of sulphuric acid			
Scottish Chemical Co. Ltd.	Glasgow	£6,500	100			Inactive since 1954			
Solway Chemicals Ltd.	Whitehaven	£700,000	100						
Thomas Tyrer & Co. Ltd.	London	£35,000	100						
<u>OVERSEAS</u>									
<u>Canada</u>									
Electric Reduction Co. Engineering Services Ltd.	/	/	/			Construction of chlorine dioxide plants	/ Details not available		
Electric Reduction Sales Co. Ltd.	Toronto	\$40,000	100*			Distribution of chemicals	/ Through Electric Reduction Co. of Canada Ltd.		
<u>Ireland</u>									
Goodbody Ltd.	Dublin	£24,000	47½	52½	Ibex Ltd.	Distributors in Eire for Albright & Wilson (Ireland) Ltd.	/ Probably controlled by Albright & Wilson Ltd.		
<u>Italy</u>									
Marchon Italiana S.p.A.	Milan	Lire 20 million	100*			Cosmetic and textile chemicals (later, detergents)	/ Through Marchon Products Ltd.		

Appendix 3

Albright & Wilson Ltd. - Factories

Location	Operating Company	Remarks
<u>UNITED KINGDOM</u>		
Oldbury, near Birmingham	Albright & Wilson Ltd.	The principal factory in the group, making phosphorus, di-sodium phosphate, other phosphorus derivatives, and oil additives
Portishead, near Bristol	Albright & Wilson Ltd.	A phosphorus plant, completed in 1954, with a capacity of 20,000 tons a year (approximately equal to that at Oldbury), all of which is sent in rail tanks to the Kirkby and Widnes factories
Kirkby, near Liverpool	Albright & Wilson Ltd.	This plant, built in 1954, converts phosphorus to phosphoric acid and thence to sodium tripolyphosphate, of which its capacity is probably more than 50,000 tons a year (though it was producing only 35,000 tons a year in the first half of 1959)
Widnes, Lancs.	Albright & Wilson Ltd.	The main products of this factory are di-sodium phosphate, tetra-sodium pyrophosphate, and carbon tetrachloride
Stratford, London, E.15.	Albright & Wilson Ltd.	This factory, operated by Thomas Tyrer & Co. Ltd. until 1954 (when that company ceased to be active), makes fine chemicals including a number of metallic salts
Whitehaven, Cumberland	Marchon Products Ltd.	A modern factory producing sodium tripolyphosphate (from phosphoric acid made by the 'wet' process), organic detergent chemicals, and household detergent preparations. It includes a high-pressure hydrogenation plant (for a description of which, see Report No. 55010/HO/SC, page 9)
Whitehaven, Cumberland	Solway Chemicals Ltd.	This factory is ancillary to that of Marchon Products. It makes 100,000 tons a year each of sulphuric acid and cement clinker from anhydrite mined on the site; its capacity may shortly be increased
Chipping Sodbury, Bristol	Bristol Mineral & Land Co. Ltd.	A mine for the extraction of strontium ore (celestine), of which it is one of the world's principal sources
Barry, Glamorgan	Midland Silicones Ltd.	Produces silicones at the rate of 1,100 tons a year (61% siloxane content)
<u>CANADA</u>		
Buckingham, Quebec	Electric Reduction Co. of Canada Ltd.	Produces phosphorus, sodium chlorate, and phosphates (both organic and inorganic)
Varennes, near Montreal	Electric Reduction Co. of Canada Ltd.	Completed in 1953 to supplement, and eventually replace, the phosphorus produced at Buckingham
Burrard Inlet, Vancouver, B.C.	Electric Reduction Co. of Canada Ltd.	Constructed in 1957 to supply sodium chlorate to the paper and uranium industries
Port Maitland, Ontario	Electric Reduction Co. of Canada Ltd.	Under construction for the manufacture of sodium phosphates and other phosphorus compounds
Port Maitland, Ontario	Electric Reduction Co. of Canada Ltd.	Electric Reduction Co. purchased this factory, which makes agricultural phosphates, in 1959
<u>AUSTRALIA</u>		
Yarraville, Victoria	Albright & Wilson (Australia) Pty. Ltd.	Products include phosphorus, phosphoric acid, and phosphates
<u>IRELAND</u>		
Dun Laoghaire, near Dublin	Albright & Wilson (Ireland) Ltd.	Manufactures phosphates, fine chemicals, and animal feeding stuffs; produces household cleaning products (e.g. Johnson's 'Pride') under licence from firms outside the Albright & Wilson group
<u>ITALY</u>		
Milan	Marchon Italiana S.p.A.	Manufactures chemicals for the cosmetic and the textile industries. By the end of 1960 it will also be producing detergent chemicals

Appendix 4

Albright & Wilson Ltd. : Sales Offices

Albright & Wilson (Manufacturing) Ltd.
1 Knightsbridge Green, London, S.W.1.
63 Temple Row, Birmingham.
75 St. George's Place, Glasgow, C.2.
69 Cabinet Chambers, Basinghall Street, Leeds, 1.
127 Royal Exchange, Manchester, 2.

Marchon Products Ltd.
140 Park Lane, London, W.1.

Clifford Christopherson & Co. Ltd.
75 St. George's Place, Glasgow, C.2.
69 Cabinet Chambers, Basinghall Street, Leeds, 1.
127 Royal Exchange, Manchester, 2.

Midland Silicones Ltd.
68 Knightsbridge, London, S.W.1.
63 Temple Row, Birmingham.
75 St. George's Place, Glasgow, C.2.
5/7 New York Road, Leeds, 2.
406 Royal Exchange, Manchester, 2.

Lubrizol (Great Britain) Ltd.
110 Strand, London, W.C.2.

Appendix 5

Albright & Wilson Ltd. - List of Principal Products

Acid butyl orthophosphate	Glassy sodium metaphosphate
Acid sodium pyrophosphate ('Puron')	Graham's salt
Alkyl aryl sulphonic acid ('Ansa')	
Aluminium phosphate	Hexaethyltetraphosphate
Ammonium dihydrogen orthophosphate	Hypophosphorous acid
Ammonium hypophosphite	
Ammonium phosphate (mono- and di-basic)	Iron phosphide
Ammonium phosphite	Lauryl alcohol
Amorphous phosphorus	Lead phosphate
Aniline phosphate	
Antimony phosphate	Magnesium ammonium phosphate
Barium hypophosphite	Magnesium hypophosphite
Barium metaphosphate	Magnesium phosphate
Barium triphosphate	Magnesium pyrophosphate
Boron phosphate	Manganese ammonium phosphate
Butyl acid phosphate	Manganese hypophosphite
Butyl phosphoric acid	Manganese phosphate
Cadmium triphosphate	Monocalcium orthophosphate ('Ibex')
Cadmium pyrophosphate	
Calcium hydrogen orthophosphate	Nickel ammonium phosphate
Calcium hypophosphite	Nickel triphosphate
Calcium lactophosphate	Pentasodium triphosphate
Calcium phosphate (mono-, di-, and tri-basic)	Phosphomolybdic acid
Calcium phosphide	Phosphoric acid
Calcium phosphite	Phosphoric oxide (phosphorus pentoxide)
Calcium tetrahydrogen diorthophosphate	Phosphorous acid
Carbon tetrachloride	Phosphorus
Cement	Phosphorus iodide (di-, and tri-basic)
Cetostearyl alcohol ('Empilan')	Phosphorus oxybromide
Chlorobromomethane	Phosphorus oxychloride
Chromium triphosphate	Phosphorus pentabromide
Cobalt ammonium phosphate	Phosphorus pentachloride
Cobalt triphosphate	Phosphorus pentasulphide
Copper triphosphate	Phosphorus sesquisulphide
Copper phosphide	Phosphorus trichloride
Copper pyrophosphate	Phosphorus trisulphide
Diammonium hydrogen orthophosphate	Phosphoryl chloride
Disodium dihydrogen pyrophosphate	Potassium hypophosphite
Disodium hydrogen orthophosphate	Potassium metaphosphate
Disodium phosphate dihydrate	Potassium phosphate (mono- and di-basic)
Dodecyl benzene sodium sulphonate ('Nansa')	Potassium phosphite
Ethylaniline phosphate	Potassium tetrapyrophosphate
Ethyl silicate	Pyrophosphoric acid
Ferric phosphate	Silicones (methyl, phenyl, and vinyl)
Ferric phosphide	Sodium alginate ('Manucol')
Ferric pyrophosphate	Sodium ammonium phosphate
Ferrophosphorus	Sodium borophosphate
Ferrous ammonium phosphate	Sodium chlorate
Ferrous phosphate	Sodium di-hydrogen orthophosphate

Sodium ferric pyrophosphate	Tetraethyl pyrophosphate
Sodium hexametaphosphate ('Calgon')	Tetrasodium pyrophosphate
Sodium hypophosphite	('Tetron')
Sodium lauryl sulphate ('Empicol')	Thioglycollic acid
Sodium metaphosphate	Tributoxyethyl phosphate
Sodium phosphate (mono-, di-, and tri-basic)	Tricalcium diorthophosphate
Sodium phosphite	Triethanolamine lauryl sulphate ('Empicol')
Sodium pyrophosphate	Triethanolamine phosphate
Sodium tetrapyrophosphate	Triethyl phosphate
Sodium tripophosphate	Trimethyl phosphate
Sodium tripolyphosphate	Tri-n-butyl phosphate
Stannous tripophosphate	Trioctyl phosphate
Strontium chloride	Triphenyl phosphite
Strontium oxalate	Trisodium orthophosphate
Strontium sulphate	Trixylene phosphate
Strontium triphosphate	Zinc ammonium phosphate
Sulphur	Zinc phosphate (mono-, and di- basic)
Sulphuric acid	Zinc phosphide
Tetrachloromethane	

Albright & Wilson have also the following products on their development range:-

Phosphine
Phosphonitrilic chloride polymers
Sodium silicofluoride

I N D E X

Acrylonitrile fibre	16	Canada	1,7,8,9,14,16,18 22,26,29,32,35,36
Ade, H. F.	30	Carbon dioxide	4
A.E. & C.I. (East Africa) Ltd.	5	Carbon disulphide	4,16,26
Albright, A.	6	Carbon monoxide	14,22
Albright, W. B.	11,27,29,31,33,34	Carbon tetrachloride	6,7,16,24,26
Albright & Wilson (Australia) Pty. Ltd.	7,30,36	Carter, W.	11,27,33,34
Albright & Wilson (Ireland) Ltd.	7,31,35,36	Caustic potash	4
Albright & Wilson (Manufacturing) Ltd.	2,5,12,27,37	Caustic soda	4,24,28
Albright & Wilson Match Phosphorus Co. Ltd.	14,35	Celestine	8,19,35
'Alfloc' products	6,21,22,24	Cement	20,27
Alginate Industries Ltd.	35	'Cereclor'	4,18
Alginates	30,35	Chipman Chemical Co. Inc.	35
Alkyl aryl sulphonates	5,17,28	Chipman Chemical Co. Ltd.	35
Alkyl phosphates	16	Chipping Sodbury	35,36
America	1,7,8,9,19,22,25,32	Chlorine	4,16,24
Ammonia	4	Chlorine dioxide	30,35
Ammonium phosphate	6,16,24	Chloroacetic acid	4,20,24
'Anglamol'	17,18	Chlorobromomethane	20
Anglamol Ltd.	8	Christopherson, Clifford, & Co. Ltd.	8,12,35,37
Anhydrite	20,27	Christopherson, J. C.	11,28,33,34
Antoliff, M. J.	27,31	Colgate-Palmolive Ltd.	17
Antelope Co. Ltd.	35	Collings, W. R.	29
Anthony, D. J. W.	31	Cia. Imperial de Industrias Quimicas do Brasil S.A.	5
'Arcton'	16	Co-operative Wholesale Society Ltd.	17
Ardeer	23	Courtaulds Ltd.	26
Aryl phosphates	16	Cumbria Trading Co. Ltd.	35
Associated Portland Cement Manufacturers Ltd., The	20		
Astoria Shipping & Transport Co. Ltd.	35	Denmark	21
'Atlacide'	35	Detergents	8,9,13,15,17,21 23,25,26,27,29,30,35
Atlas Preservative Co. Ltd.	35	Dickie, R. C.	28
Australia	7,26,30,32,36	Distillers Co. Ltd., The	4
Austria	25	Dodecyl benzene	17
Bains, P.	28	Domestos Ltd.	17
Baking powder	7,8,16	Dow Corning Corporation (U.S.A.)	8,9,18,28,29
Barium compounds	20	Duperial Argentina - see Industrias Quimicas Argentinas	
Barratt, S.	11,28,29,33,34	'Duperial', S.A. Com. e Ind.	
Barry	13,18,28,36	Duperial Uruguay - see Industrias Quimicas Uruguayas 'Duperial',	
Barton, K. A. M.	29		
Bass, S. L.	29		
Belgium	25		
Berk, F. W., & Co. Ltd.	4	Edquist, R. C.	31
Birmingham	6,12	Eire	13,21,35
Boake, A., Roberts & Co. Ltd.	8,9,11,26	Electric Reduction Co.	
Bottomley, J. K.	27	Engineering Services Ltd.	35
Bradford Dyers' Association Ltd., The	20,35	Electric Reduction Co. of Canada Ltd.	7,9,29,35,36
Breyfogle, R. J.	29	Electric Reduction Sales Co. Ltd.	35
Bristol	19	Electro-thermal process	7,15
Bristol Mineral & Land Co. Ltd.	8,19,35,36	'Empicols'	17
British Match Corporation Ltd.	35	Ethyl aniline phosphate	16
Butanol	4	Ethyl silicate	8
Cadmium compounds	20	Ethylene oxide	17
Calcium phosphate	21	European Common Market	24,25
'Calgon'	6,15,21,22,24	Evans, C. B.	29
'Calgonite'	21,22	'Fab'	17

I N D E X

Fatty acid alkylolamides	17	Ireland	7,31,35,36
Fine Chemicals Division	12	Isobutyl alcohol	18
Flame-proofing chemicals	22,26,35	Italy	25,35,36
Florida	14		
Foodstuffs	13,15,26,31		
France	18,25,27	Jones, Dr. D. E.	30
Freeman, E. P.	31	Jones, R. D. R.	30
Freeman, J. W.	31	Jones, Rt. Hon. Arthur Creech	28
Free Trade Area	25,26		
Fungicides	22		
		'Kanigen'	21
General American Transportation Corporation	21	Kirkby	1,8,15,27,36
Glasgow	12,35	Leeds	12
Glen, J. R. A.	31	Lime	4
Goodbody Ltd.	13,35	'Lissapol'	23
Goodbody, N. R.	31	London	12,27,35,36
Goodbody, V. P.	31	Loveless, A. H.	27
Grange Chemicals Ltd.	17	Lowson (London) Ltd.	28
Gregory, R. A.	29	Lubrizol Corporation (U.S.A.)	8,17,18,35
Greville, P. E.	31	Lubrizol (Great Britain) Ltd.	8,35,37
'Hagafilm'	22		
Hagan Chemicals & Controls Inc.	22	Manchester	12
'Hagevap'	21	'Manucol'	35
Halfpenny, A. C.	28	Marchon Italiana S.p.A.	35,36
Hall, Dr. F. E.	7	Marchon Products Ltd.	
Hedley, Thomas, & Sons Ltd.	17	1,2,5,6,8,12,13,15,17,18	
Heptyl phenol	18	20,23,25,27,28,30,35,36,37	
'Hetron'	32	Marzillier, F.	27,28
Holland	25	Matches	6,7,14
Holmes Marine Life Protection Association Ltd.	35	Maunsell, R. M.	30
Hooker Chemical Corporation	9,22,32	McKenzie, G. R.	30
Hutchinson, I. W.	29	'Mellite'	20
Hydrochloric acid	22	Metal finishing	13,21,26
		Metal & Thermit Corporation of America	22
'Ibex'	16	Methanol	22
Ibex Ltd.	31,35	Methyl chloride	4,18,19,22
I.C.I.A.N.Z. Ltd.	7,30,31	Methyl methacrylate	18
I.C.I. (Brazil) - see Cia. Imperial de Industrias Quimicas do Brasil S.A.		Methylene chloride	20
I.C.I. (China) Ltd.	5	Mexico	18
I.C.I. (Export) Ltd.	5	Michelmore, W. M.	31
I.C.I. (India) Private Ltd.	5	'Micromet'	21
I.C.I. (Israel) Ltd.	5	Midland Silicones Ltd.	1,2,9,12,13
I.C.I. (Malaya) Ltd.	5	18,19,22,23,27,28,35,36,37	
I.C.I. (N.Z.) Ltd.	5	Midland Silicones (Sales) Ltd.	35
I.C.I. (Pakistan) Ltd.	5	Moffit, T. E.	32
I.C.I., S.A. Peruana Com. e Ind.	5	Monocalcium orthophosphate	16
I.C.I. (South Africa) Ltd.	5	Murgatroyd's Salt & Chemical Co. Ltd.	4,24
I.C.I. (Sudan) Ltd.	5	Murray, R. L.	32
I.C.I. (Turkey) Ltd.	5		
Imperial Smelting Corporation Ltd.	26	'Nansa'	17
Industrias Quimicas Argentinas		Nederlandsche Verkoopkantoor Voor Chemische Production	25
'Duperial', S.A. Com. e Ind.	5	Netherlands	25
Industrias Quimicas Uruguayas		New Zealand	30,32
'Duperial'	5	Niagara Falls	7,32
Insecticides	16,22	Nitrate of soda	4

I N D E X

North Africa	14,15	Sodium tripolyphosphate	1,8,15,28
		Solway Chemicals Ltd.	2,6,20,35,36
O'Brien, G. W.	31	Sorensen, A.	31
Oil additives	1,8,16-18,22,35	South Africa	32
Oldbury	6,7,8,13,14,15,21,27,35,36	'Spel'	17
Oldbury Electro-Chemical Co. Inc.	1,7,9,32	Staveley Iron & Chemical Co. Ltd.	35
Organic Chemicals Division	12	'Stergene'	17
Organo-tin compounds	20,22	Strong, Dr. H. W.	31
Oxalic acid	4,24	Strontium	19
Peech, N. M.	11,33	Strontium chloride	19
Pentecost, F. G.	11,33	Strontium nitrate	19
'Phoryl' adhesives	22	Stubbs, L. W.	27
'Phorosol'	22	Sulphamic acid	23,26
'Phosbride'	21	Sulphated fatty alcohol	17,28
Phosphine	23	Sulphur	6,16
Phosphonitrilic polymers	22,26	Sulphuric acid	15,17,20,23,27,35
Phosphoric acid	6,15,21,22,23,25,26,29,30	Swanson, Y. B.	31
Phosphorus	1,5-7,9	Sweden	18,25
	14,15,18,21,22,29,30,32,35	Switzerland	25
Phosphorus oxychloride	6,16	Talbot, R.	27
Phosphorus pentasulphide	16,17	Tartaric acid	35
Phosphorus pentoxide	15	Tetrakis hydroxymethyl phosphonium chloride	20
Phosphorus sesquisulphide	5,7,16	'Tetron'	15
Phosphorus trichloride	6,16	Thioglycollic acid	20
Piercy, Keith, Ltd.	35	Threlfall, R. E.	11,33,34
Piercy, W. E. K.	11,29,33	Tizard, Sir Henry Thomas	28
Plant Protection Ltd.	35	Topley, B.	11,13,33,34
Plasticizers	8,16,20,22,26	Towle, A.	35
Plastics	13,22,32	Tributyl phosphate	16
'Plusbride'	21	Triphenyl phosphite	16
Polyvinyl chloride	20	Tucker, E. J.	29
Portishead	1,8,14,27,36	Tyrer, Thomas, & Co. Ltd.	8,35,36
Proban Ltd.	20,35	Unilever Ltd.	17
'Puron'	16	Uranium	16,30
Pyrophosphoric acid	15		
Reymersholms Gamla Industri Akt.	25	Victor Oxide catalyst	15
Rhône-Poulenc S.A., Soc. des			
Usines Chimiques	27		
Rist, D.	31		
Salt	4,22,24	Wakefield, C. C., & Co. Ltd.	18
Schon, F.	11,27,28,33,34	Walters, G. E.	29
Scottish Chemical Co. Ltd.	35	Wansborough-Jones, Sir Owen	11,34
Seath, J.	30	Water treatment	7,13,15,21,23,24
Secher, O.	28	Watson, C. L.	30
Sherwood, A. V.	27	Weedkillers	29
Silicones	1,8,18,23,24,25,27,28,30,35	Weickhardt, L. W.	31
Siloxane	18,19	Western Germany	25
Smith, S.	30	'Wet' process	15,20,23,26,36
Sodium carbonate	4,15,22	Whitehaven	8,13,15,17,20,27,35,36
Sodium chlorate	9,29	Whitford, Dr. E. L.	30,32
Sodium hexametaphosphate	6,7,15,21,24	Widnes	4,7,14,15,16,27,36
Sodium lauryl sulphate	6	Wilson, C. N.	11,27
Sodium phosphate	15,21,22,23,25,29	Wilson, J. C.	11,27,33,34
Sodium pyrophosphate	7,15,16	Wilson, J. E.	6
Sodium silicofluoride	23,26	Wilson, K. H.	12,34
		Wilson, Mrs. H. J.	12
		Zinc	7,16